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First principles modeling of three-phase interface system of ZrB2-ZrC-ZrSi2

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Abstract

Amongst different living organisms studied as potential candidates for the green synthesis of copper nanoparticles, algal biomass is presented as a novel and easy-to-handle method. However, the role of specific biomolecules and their contribution as reductant and capping agents has not yet been described. This contribution reports a green synthesis method to obtain copper oxide nanoparticles (CuO-NPs) using separated protein fractions from an aqueous extract of brown algae Macrocystis pyrifera through size exclusion chromatography (HPLC-SEC). Proteins were detected by a UV/VIS diode array, time-based fraction collection was carried out, and each collected fraction was used to evaluate the synthesis of CuO-NPs. The characterization of CuO-NPs was evaluated by Dynamic Light Scattering (DLS), Z-potential, Fourier Transform Infrared (FTIR), Transmission Electron Microscope (TEM) equipped with Energy Dispersive X-ray Spectroscopy (EDS) detector. Low Molecular Weight (LMW) and High Molecular Weight (HMW) protein fractions were able to synthesize spherical CuO-NPs. TEM images showed that the metallic core present in the observed samples ranged from 2 to 50 nm in diameter, with spherical nanostructures present in all containing protein samples. FTIR measurements showed functional groups from proteins having a pivotal role in the reduction and stabilization of the nanoparticles. The highly negative zeta potential average values from obtained nanoparticles suggest high stability, expanding the range of possible applications. This facile and novel protein-assisted method for the green synthesis of CuO-NPs may also provide a suitable tool to synthesize other nanoparticles that have different application areas..

Biography:

Serzat Safaltin received his BSc degree in metallurgy and materials science engineering from Istanbul Technical University (ITU), Istanbul, Turkey, in 2015. He received his MSc degree in extractive metallurgical technologies engineering from ITU, in 2017. He is currently a PhD student and a research assistant in the metallurgical and materials engineering department at ITU. His research interests include modeling & simulation, 2D materials and metallic alloy nanoparticle production, cleanroom fabrication, and characterization methods. Meltem Bolluk received her BSc degree in metallurgy and materials science engineering from Istanbul Technical University (ITU), Istanbul, Turkey, in 2012. She received his MSc degree in materials science and engineering from ITU, in 2015. She is currently a PhD student and a research assistant in the metallurgical and materials engineering department at ITU. His research interests include chemical vapor deposition, powder metallurgy and characterization methods.

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